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ABSTRACT

The design issues involved in the effective use of computer-mediated communication in a multimedia distance education environment are examined, with particular reference to recent and current initiatives at the Open University in Great Britain. A description of the components of the Open University's electronic campus (the conferencing system and the national computer network) is followed by a discussion of specific design issues (interface design, design of electronic social environments, and overall course design). It is concluded that the key factors that seem to influence the perceived value of computer-mediated communication for effective collaborative learning include: (1) the ease with which the basic mechanics of the system can be learned (due in part to an improved interface design); (2) the design of the electronic social environment within which interactions occur; (3) the relative importance of computer-mediated communication as a communication tool, compared with other available media and channels of communication; and (4) the skills of course tutors in setting up and moderating computer conferences. (11 references) (GL)

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COMPUTER-SUPPORTED COLLABORATIVE LEARNING IN A MULTI-MEDIA DISTANCE EDUCATION ENVIRONMENT

Prepared for the NATO Advanced Research Workshop on
Computer Supported Collaborative Learning,
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Introduction: old and new media in distance education

Distance education systems, which provide instruction to large numbers of students spread over wide geographical areas, characteristically use a range of different media and teaching methods, each associated with particular learning goals. For example, specially written print materials, designed to encourage active participation by the reader, and to allow a variety of reading strategies, are generally used to convey the principal academic content of a course. Television broadcasts may be used to demonstrate scientific experiments, to visualise dynamic processes, or to convey primary source materials of a visual nature, whereas live radio broadcasts often serve feedback and magazine functions. Contact with tutors and other students, at face-to-face meetings or over the telephone, is generally the occasion for discussing learning difficulties related to particular concepts in the course, for analysing homework assignments, or for carrying out group learning activities. Correspondence tuition provided by tutors to individual students is usually focussed on assignment work submitted for grading purposes. Other media traditionally used in the distance education context (eg audiocassettes, videocassettes, CAL software) each have their specific role to play in what is generally a carefully orchestrated educational composition.

A major drawback to many distance education programmes is the relatively 'inert' nature of the courses - especially when these consist of expensively produced integrated multi-media materials (e.g videotapes, texts, CAL software, broadcasts etc). Up-dating and changing of such courses in the light of new research and perspectives is costly, and indeed many distance education courses are designed to be re-run over periods of 6-10 years in essentially their original form, thus amortising high course development costs over an extended period of time. The changes that an individual classroom teacher might make in response to student needs and new developments in the field become impossible in a standard distance education course. Another problem common to traditional distance

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education is the lack of opportunity for dialogue, debate, conversational learning, and collaborative work. Much emphasis is thus placed on the *personal* motivation and self-reliance of the individual student, who lacks the many occasions for interactive discussion, argument, and group activity that characterises any good face-to-face educational situation involving mature adult learners. Furthermore, tutors are often employed primarily as mediators of the packaged course materials, and as evaluators of individual student's work, rather than as facilitators of group-based learning processes.

It could be argued that the new information technologies which involve selective interactivity (giving learners access to computer-based and easily up-dated sources of information) and full interactivity (communication with other learners and with tutors) will help remedy these drawbacks (Henri, 1988), at the same time giving students and tutors a more central role in the educational process. *A priori*, it would seem that the increasingly widespread computer-based communications media should be able to bring a new, interactive, convivial, and collaborative dimension into the traditionally very individual, even solitary, distance learning experience (see, for example, Lamy, 1985). Asynchronous computer-based messaging and other forms of computer-mediated communication could, theoretically, play a major role in enhancing the quality of distance education, provided that technical and cost barriers are minimal (ie that learners and tutors have easy access to the necessary equipment, that telecom charges are kept down, and that the software is sufficiently user-friendly). Evidence from trials of computer conferencing within a traditional teacher-centred educational paradigm (the 'virtual classroom', the 'online graduate seminar') suggests that students and teachers can replicate electronically the dialogue that occurs in the face-to-face class, and that in some respects (eg increased levels of turn-taking by students) this electronic dialogue may be even richer (Hiltz, 1986; Harasim, 1987).

Features of computer-mediated communication (CMC) which seem particularly adapted to the distance education situation include:

- the overcoming of space, time, and access constraints to communication amongst students and tutors: any one user can conveniently find and contact any other users of the network, in a way which is virtually impossible using traditional communication methods
- the convenience of a store and collect technology for message handling: texts can be sent and read at times chosen by each individual user
- the text-based nature of the medium (as opposed to voice or audio-visual communication), which is consonant with the skills of textual analysis and composition which are key features of the distance learner's repertoire
- the central storage of all text, so that messages or parts of messages can be retrieved at will at a later date, and used in a variety of ways (eg text can be

down-loaded and edited into other documents, written comments from fellow-students or a tutor can be incorporated into an ongoing piece of work, the text of a conference can be subsequently edited to produce a report)

- the facility for group communication, which could be used for self-help activities amongst students, for co-operative learning, for on-line seminars, and for team-work in creation of project documents and assignments.

This paper raises questions about the design issues involved in the effective use of computer- mediated communication in a multi-media distance environment, with particular reference to recent and current initiatives at the Open University in Britain (see, for example, Kaye, 1987; Mason, 1989; Thomas, 1989).

The Open University's 'electronic campus'

When the Open University decided to proceed with a major implementation of a computer-mediated communication system for one of its high population undergraduate courses, a review of available software led to the choice of the CoSy conferencing system, developed at the University of Guelph in Ontario. CoSy thus forms the basis of the University's national 'electronic campus'.

The CoSy conferencing system

The operation of CoSy can be well explained from the user's point of view through the metaphor of the writer's desk (see figure 1). This metaphor is particularly appropriate to the distance learner's situation - it emphasises CMC as a medium of written discourse (correspondence has always been the lifeblood of distance learning), but it also shows the different types of written communication that are possible, and hints at how the central computer stores and structures information pertaining to users and to conferences, thus promoting a far more active and extensive form of communication than traditional correspondence.

The main features of the CoSy system include:

- Electronic mail, with separate 'baskets' for different categories of mail (new mail, held mail, acknowledged mail)
- Conferences, which can be 'read only' (ie essentially for posting notices) or 'read/write' (for collaborative discussion), open or closed, confidential (ie unlisted) or public (details appear in a public conference directory); a given conference may have several 'topics' each one set up by the conference moderator; messages in conferences can be searched in various ways, and the system provides information on the status of each conference (numbers of read and unread messages, date and time when each member last

accessed the conference etc.

- 'Conversations', which are single topic group discussion areas designed for informal communication - any user can set up a conversation, and any member of a conversation can join any other member of CoSy to it; conversations are not publicy listed, do not have moderators, and the messages auto-destruct when the last member resigns
- A 'scratchpad' area for preparing and editing message texts on-line, although the use of PC's and local editors means that many users prepare their contributions off-line, before connecting to the system and uploading them
- Directories of users, containing their personal resumés, and of conferences.

The Open University's national computer network

CoSy runs on the Academic Computing Service's VAX cluster at Milton Keynes, where the University's academic and administrative headquarters is based, and is accessible from anywhere in the country. The Open University is a national institution, catering for over 100,000 home-based adult students throughout Britain. Local support (eg tuition, counselling) for students is organised through 13 Regional Centres and 3 sub-offices throughout the country. Each of these sites houses dial-up multiplexor nodes which are connected to the VAX cluster in Milton Keynes via leased lines. Staff in the regional centres can use terminals or PC's from their offices to connect to the VAX cluster. Students and part-time tutors throughout the country who have ID's on the system can telephone their nearest dial-up node and be connected through to CoSy, paying only the cost of the phone call to that node. Unfortunately, students living outside the local dial-up range of a node pay long-distance telephone charges - they are in fact doubly disadavantaged, as they also tend to have to travel furthest to study centres for face-to-face tutorials.

The first inhabitants of the electronic campus

The CoSy system was installed at the Open University primarily for use on the second-year undergraduate course *An Introduction to Information Technology: Social and Technological Issues* [course code DT200]. This is one of over 200 undergraduate courses, and the only one currently using computer communication an any scale. It is a popular course, with annual enrolments of over 1,300 students. The course was first offered in 1988, and is now (August, 1989) nearing its second year of presentation. It is a standard multi-media OU course in many respects, with print, audio-visual, and face-to-face components. However, about 25% of the student's estimated 400 hours study time is spent on practical work activities, using a PC at home. These activities include learning to use word-processor, communications, spread-

sheet and data-base software, as well as a notional 10 hours connect time throughout the year on CoSy.

CoSy is presented to the students taking DT200 as providing an 'electronic campus' (see Figure 2) where they can go to the 'Mail Building' to collect and send their mail, socialise with other students in the 'conversation area', and take part in formal on-line tutorials (in local tutor group and regional conferences) in the 'Tutorial Building'. Other buildings on this virtual campus include a 'Training Centre' (where students can learn how to use CoSy), a 'Student Union' with a forum conference to which all students, tutors, and course team members can contribute, and an 'Information Centre' where urgent notices from the course team are posted in a 'news' conference. There is also a 'Records Office', where students can look up other CoSy users' resumés, and scan the list of public conferences. Not shown on the map is a 'Senior Common Room', which is a restricted, unlisted conference open only to tutors and course team members. This is the place where tutors provide feedback to the course team, make proposals for improvements to the course, and discuss assessment issues.

Current students also have the chance to get in touch with DT200 'alumni', who took the course in the previous year. About 70 students from 1988 asked if they could keep their ID's on CoSy, and many of them are proving to be a valuable source of help and guidance for this year's cohort. This type of peer teaching and help is not normally possible on conventional OU courses.

The top left-hand end of the campus map indicates that students on DT200 can, if they wish, spend time in reading and contributing to other (non-course) conferences on CoSy, as the early residents of the campus include a small number of central and regional staff who have taken up this new medium with enthusiasm. In mid-1989, there were around 100 open conferences on CoSy, on topics ranging from the USSR and China to film reviews, writing in French, the latest Macintosh software, and the quality of life in Milton Keynes. There is even a collectively authored spy novel which is now several hundred pages long. A small but growing number of overseas campus personalities (including a DT200 student who logs in from Hong Kong several times a week, and academics and researchers from France, the USA, Canada, Denmark, Australia, and the USSR) bring an international dimension to the growing electronic community.

Altogether, at the present time, there are over 450 group conferences and conversations on the OU's CoSy system, about half of which are currently active. The total numbers of messages in these conferences and conversations exceeds 29,000, whilst over 73,500 email messages have been written since CoSy became operational in 1987.

It is not the intention here to present an evaluation of the impact of CoSy at the Open University, and, in any case, it is too early yet to make any conclusive judgements. However, the use of CoSy by students and tutors on the DT200 course in its first year of presentation is analysed by Mason (1989). She concludes by saying that : "*...for the majority students, tutors, and course team members, computer conferencing was an interesting but marginal activity, For the committed or 'converted' minority, however, there is little doubt that this medium was an exciting, innovative, and satisfying way of participating in distance teaching and learning*". For an example of the view of one of the more enthusiastic students , see Malone (1989), who says that : .." *the use of computer-mediated communications in particular marks it as a course operating at the leading edge of educational technology* .."

Design issues

The final section of this paper draws on the evaluation of the experiences of the first major student and tutor users of CoSy in 1988 and 1989 to briefly highlight some of the design issues involved in trying to integrate computer conferencing into a distance education system. Three levels of design are looked at (interface design, the design of electronic social environments, and overall course design) and an attempt is made to analyse they ways in which decisions taken at these different levels impinge on the use of CMC for collaborative learning.

Interface design

CoSy, like many other current computer conferencing systems, is a scrolling text medium designed for asynchronous communication through dumb terminals (or a diverse range of microcomputers running terminal emulation software) connected to a central computer on which messages are stored, filed, and processed according to instructions given by message senders and receivers, and by conference organisers or moderators. The combination of these features with the local processing that users can carry out on their own micro-computers (word-processing, off-line editing, uploading and downloading of texts, local interfaces, setting of communications parameters, etc) can create severe comprehension problems for naive users.

The issue of interface design, of course, goes beyond the way(s) in which information is presented on the user's screen. Before this there needs to be a conceptual framework to which the screen events can be mapped, and here lies the first major design problem. Computer conferencing is a unique form of group communication, sharing some features of face-to-face meetings, of telephoning, of letter-writing, of word-processing, and of 'notice-posting'. It takes time for newcomers to a CMC system to become sufficiently familiar

with both the system commands and with navigating from one 'place' to another, to be able to feel they have mastered the full potential of this medium. Two approaches to dealing with these issues seem to be commonplace now (pending the development and availability of more sophisticated CSCL systems), and we have used both at the Open University.

The first approach is to try to provide new users with metaphors which will help them to relate this new medium to other, more familiar, ones. The metaphor of the writer's desktop shown in Figure 1 (already successfully used elsewhere, of course!) is one such approach. Another is the virtual 'electronic campus' (Figure 2) which tries to suggest that CoSy might be a substitute for the Open University's non-existent student campus, with places specially set aside for study, recreation, and inter-personal communication. This latter metaphor also provides strong indications of what counts as 'proper' behaviour in different places on the campus (eg keep the limericks, jokes, and other chit-chat in the 'Student Union' and the 'conversation area', and out of the tutorial conferences).

The second approach is to provide a local front-end to the conferencing system, which gives users the option of selecting commands from pull-down menus. This also provides an opportunity for signalling some sort of structure over the scrolling text screen. The MS-DOS front-end which we have designed for CoSy (OUCom) reflects the main features of the campus map: the indications in upper case on the signpost at the entrance to the campus, correspond to the principal menus [CONFERENCES, MAIL, and PEOPLE] on this front-end shell. OUCom also allows for automated logging-on, and for turning a 'recording' option on or off during an on-line session, thus allowing users to choose which items they want to download to disk.

The OUCom front-end is an essential element of the user training material provided to students - note that they have little opportunity for face-to-face induction sessions. The other key elements of the CoSy self-training package include a specially prepared printed unit, with a series of carefully structured exercises. Some of these exercises are accompanied by an audio-cassette commentary, which guides the student through the key-strokes and other operations involved in logging on and reading and contributing messages.

In designing the initial introduction to the use of CoSy, and in the specific features of the menu-driven interface, stress was put on the group communication functions, rather than on the email function. So the 'tutorial building' is highlighted on the campus map, and the CONFERENCE menu is the first and most important menu to appear on OUCom. The CoSy commands for managing conference information, such as 'skip', 'list headers', and 'ref' (which allows one to access all the comments on a particular message

without seeing any intervening messages) were given a prominent place on the CONFERENCE menu. Furthermore, the various CoSy commands that enable one to find out about other users (their resumés, when they last used CoSy etc) are grouped under the PEOPLE menu on OUCom, to emphasise how easy it is to follow up on interesting messages put into conferences by other (unknown) students and tutors, and thus encourage inter-personal networking and the establishment of special interest groups (eg via CoSy's 'Conversation' function). These various design choices were part of a deliberate strategy to encourage new users to consider conferencing as more important than person-to-person electronic mail, and to encourage students to make new contacts beyond their local tutor groups, thus preparing the way for the development of collaborative learning activities.

The design of electronic social environments

Feenberg (1989) argues that .."computer-mediated communication provides *electronic social environments* for the activities that take place online...which are as socially specific as the various interiors designed for different types of meetings organised in face-to-face settings", and that CMC systems demand that careful attention be paid to social factors in the design both of individual groupware products, and of the communication environments set up by users on any given system. Putting people into a conferencing environment without giving them clearly defined roles to fill, and identifiable 'spaces' for them to enter their different types of contributions, would be like inviting them to a residential course without telling them who was in charge, what activities were going to take place, and in which rooms of the buildings. It is unlikely in either situation that any significant levels of collaborative learning would occur, unless particular individuals took the initiative to organise an appropriate framework within which constructive group processes could develop.

In this instance, apart from a few minor modifications to the CoSy source code, it was not possible to make major changes to the software in the light of our specific needs. However, there are a number of tools and features within CoSy which permit a certain amount of tailoring of the conferencing environment. For example, conferences can be set up as being closed (accessible only to a named list of people) or open (accessible to anyone on the system); conferences can be 'read only' (only one person, the moderator, can post messages - effectively, the 'conference' becomes a notice-board) or 'read/write' (every member can both read and submit messages). And individual topics within a 'read/write' conference can be 'read only' or 'read/write'. Finally, a conference moderator can change the status of a conference or conference topic, and add or remove members.

Every student on the DT200 course is automatically joined to two closed course-related conferences: one including only the members of her local tutorial group (one tutor and 20-25 students), the other including all the tutorial groups in her region (up to around 160 students and 8 tutors). The regional conferences have become the principal arena for collaborative learning/teaching activities, as explained below. Students have the option, if they wish of joining a national, open, 'forum' conference for more wide-ranging discussion of the academic issues covered in the course. Although students are not automatically able to open their own conferences, they are able to set up 'conversations' on CoSy, and a significant minority of students have used these for socialising, and for cooperative self-help discussions related to the course (eg discussion of the course assignments and project, mutual help with difficulties in understanding the course material etc). Finally, a student who wishes to start a closed or open conference, and who can gain the support of ten or more others, is given the privilege. In 1988, a number of such conferences were set up, including an on-line newsletter, which attracted contributions on a wide range of issues from students, tutors, and central University staff.

In the first year of the course, the tutor group conferences were supposed to be the main loci for collaborative learning on CoSy. Each of these 65 conferences had a 'chat' topic for socialising, and topics related to specific blocks of the course, and to specific aspects (such as the assignments, the course project, practical work etc). As the membership of each of these conferences was the same as that of the local tutorial groups (hence the students and tutor in each group had opportunities to meet face-to-face), and as the size of the groups (20 - 25 members) seemed, from previous studies , to be optimal, it was assumed that these conferences would be fairly active, and that they would represent the primary sites for course-related collaboration. In fact, this hope was not realised in the great majority of groups, where activity was relatively sporadic, with only a few regular contributors. Content of messages tended to be at the level of information exchange, with little evidence of comments building one upon another to form real discussion threads.

On the other hand, the national 'forum' conference in 1988, which was open to all students and tutors in the course, was very active, with many examples of real discussion sequences in the block topics, and much evidence of students helping each other over difficulties with the practical work, the course software, and equipment malfunctions (the 'gremlins' topic ran to over 700 messages). However, this very level of activity led to complaints from students who only logged on occasionally, and were dismayed at the large numbers of unread messages awaiting them when they visited the 'forum'.

These problems were widely discussed amongst tutors, and between tutors and central course team staff, in the closed 'senior common room' conference on CoSy, and as a result, the electronic environment was re-designed for 1989. Tutor group conferences are now reserved for discussion of the assignments and the arrangements for face-to-face tutorials, whilst the main academic discussion on the specific blocks of the course has shifted to six newly established regional conferences. In each conference, there is one tutor with overall moderating responsibility, who also coordinates the roles of the other tutors in the conference. Hence it has been possible to instigate a certain amount of electronic team teaching, with individual tutors being responsible for leading discussions on specific blocks of the course, between specified dates. Persusal of the transcripts of some of these regional conferences shows clear evidence of students and tutors making comments which build on previous contributions, and which enrich the course through the opportunities for them to display their own personal knowledge and skills (the students are all adults, and many of them have professional experience of course-related issues, eg telecommunications, office information systems, electronics, computing).

In concluding this brief analysis of DT200's 'electronic campus', it is legitimate to ask to what extent the design (and re-design) of the conferencing environment has affected the level and quality of collaborative learning on the system. This is a difficult question to answer. Certainly, in the case of DT200, evidence from the conference transcripts suggests that the establishment of the regional conferences has increased both participation rates, and the quality of the discussions. Of course, the tutors are more experienced in conference moderation skills than they were in the first year of the course, but the main factor in the improvement seems to be the re-design of the environment.

However, the basic methodological question remains of how to adequately evaluate the quality and degree of collaborative learning amongst the participants of a computer conference. It is necessary to go beyond simple quantitative measures. Even message maps (Winkelmans, 1988; Harasim, 1989) which show the interconnections between messages in a conference, are inadequate tools for gaining any understanding of the quality of the cognitive processes engendered by participation in a computer conference. Typically, in the DT200 regional conferences, around 10% of the students contribute most of the comments, whilst another 50% or so log on fairly regularly, but 'lurk' (read the messages without making any contributions themselves). Another 30% or so hardly ever log on. Although the 'lurkers' are not leaving explicit written evidence in the form of messages, it would be rash to assume that they are not benefitting from eavesdropping on the on-line discussions (just as it would be unwise to assume that students who take part in face-to-face seminars without themselves contributing are gaining nothing from the

experience). The very asynchronicity of conferencing makes it likely that many 'lurkers' spend more time reflecting on conference comments in between successive logons than they would in the much more compressed time-scale of a face-to-face discussion. And in some cases, they might even have drafted contributions of their own, then not submitted them because, in the meantime, someone else had made the same point. However, the process of having thought out possible ideas, or a draft, for a contribution, is - for the individual student - as important as having actually posted the contribution to the conference.

Adequate evaluation of the extent of collaborative learning in computer conferences requires, therefore, not only a detailed content analysis of conference transcripts, with messages being classified and coded according to the extent to which they stimulate later contributions and/or build on earlier ones, but also in-depth interviews with non-contributors, to assess what value they attach to an apparently passive - but possibly cognitively active - mode of participation.

Overall course design

The current use of computer conferencing at the Open University bears little resemblance to other existing educational applications of CMC. Most previous experience and research revolves around the use of conferencing in a 'virtual classroom' or 'virtual seminar' mode, with one teacher/moderator and a group of 12-25 participant students, devoting most of their course time to on-line discussion and to the presentation and commenting of papers and assignments submitted by the students. In some cases, the course structure will require participants to produce collaboratively authored documents, or to carry out structured group activities (eg business games, simulations) on-line.

The use of CoSy on the DT200 course, on the other hand, is a relatively marginal activity (representing maybe 5% of total study time for the average student), and was included on the course primarily as an example of information technology in action (ie an object of study, part of the course content) and only secondarily as a learning/teaching medium. The tutors who are expected to take a key role in moderating discussions on CoSy are not the same people who developed the high quality multi-media teaching materials (texts, software, videos, audio-tapes etc) which form the core of the course. The majority of students and tutors have neither the time nor the money to spend more than an hour or two each week , at the very most, in conferencing-related activities.

The challenge for distance teaching institutions like the Open University in using CMC effectively is how best to integrate it into a teaching system which

is multi-media, and aimed primarily at very large numbers of independent learners. Two basic approaches to this general course/curriculum design issue seem possible.

The first approach is to integrate conferencing into the standard multi-media course produced by the Open University, placing particular emphasis on functions such as immediacy, feedback, up-dating of course material, tutorial support, and collaborative work by groups of students. This is the approach to be adopted by a number of courses in the MBA programme of the University's School of Management, where conferencing will be used in conjunction with access to on-line data-bases. However, it is not clear how successful this approach will be in resolving inherent basic issues such as:

- the relatively small amount of time allocated to on-line activities in the overall course structure, which may not be sufficient for students to gain familiarity with the medium quickly enough to reap the full benefits from their participation
- the conflict between the relatively instrumental learning style favoured by many OU students (and encouraged by the standard course design), which is basically one of independent study of the course material, followed by completion of homework assignments, and the emphasis on collaboration, sharing of experiences, and group work which is the *raison d'être* of conferencing
- the formulation of institutionally acceptable assessment procedures for assigning individual grades to students' contributions to group projects conducted via CMC
- the role of CMC relative to other forms of inter-personal communication available in the OU system (evening tutorials, day schools, telephone and postal contact, local self-help groups etc): evening tutorials and day schools are optional components of many OU courses, and attendance at them is very variable - should computer conferences have the same status, and students simply be encouraged to choose the group communication mode which they prefer?

These are only a few of the course design issues that will have to be resolved if CMC is to be integrated successfully into the University's multi-media course model.

The second approach would be to break away from the standard course design for certain types of course - particularly those specialist and post-graduate courses with very low student numbers each year (ie less than 150 or so students), which attract students who have specialist and professional knowledge in the field which they could successfully contribute. Such courses could be mounted with a fraction of the capital costs invested in a conventional Open University course, but would require relatively higher course presentation budget for the much heavier teaching/ conference

moderating load that tutors would be expected to carry. Courses could be designed on the 'on-line seminar' model, with students being provided with basic course objectives and readings, allocated to small study groups, and required to participate actively in conferencing discussions, and submit work on-line for discussion by the tutor and the rest of the group.

Both of the appoaches outlined above have their merits and drawbacks. Intermediate models will surely develop, as will a general framework for the formal integration of CMC and CSCL into the University's teaching system. At the moment, for example, discussions are being opened on the possibility of establishing a virtual 'electronic region' (the University has thirteen geographical regions) which will cater not only for courses in which CMC is a built-in component, but which could also provide CMC support services for special groups such as housebound, disabled, geographically remote, and overseas students.

Conclusion

The experience of the use of computer-mediated communication as part of a multi-media distance education course has shown that it is feasible for naive users to master the technicalities of computer conferencing and electronic mail without the benefit of face-to-face induction/training sessions. Each year, over 1300 students on the Open University's *Introduction to Information Technology* course learn, through self-study material, how to use communications software and a modem with their PC, as well as the basic rules of etiquette of computer-mediated communication. CMC has, on this course, provided a channel for rapid feedback from students and tutors to course develpment staff, as well as giving students, for the first time on such a scale, the chance to help each other resolve difficulties with the course material and its associated hardware and software. It has also been demonstrated that, although the primary objective of using CMC in this case was to give students experience of a specific IT implementation, it has been invaluable, for some students and tutors, as a tool for collaborative learning.

The key factors which would seem to influence the perceived value of CMC for effective collaborative learning include the ease with which the basic mechanics of the system can be learned (improved interface design has helped here), the design of the electronic social environment within which interactions ocur, the relative importance of CMC as a communication tool compared with other available media and channels of communication, and the skills of course tutors in setting up and moderating computer conferences. Future developments of the effective use of CMC within traditional multi-media distance education systems will probably require a basic re-thinking of course design and development strategies, involving a shift from an

emphasis on capital investment in high-quality packaged course materials, towards greater levels of recurrent expenditure on course presentation costs (e.g. tutor payments, on-line charges). Such a trend would be consistent with an increasingly generally held view that distance education systems should place more emphasis on active and cooperative learning strategies which value the personal experience and knowledge which both students and tutors can contribute, and that CSCL might well play a major role in this process.

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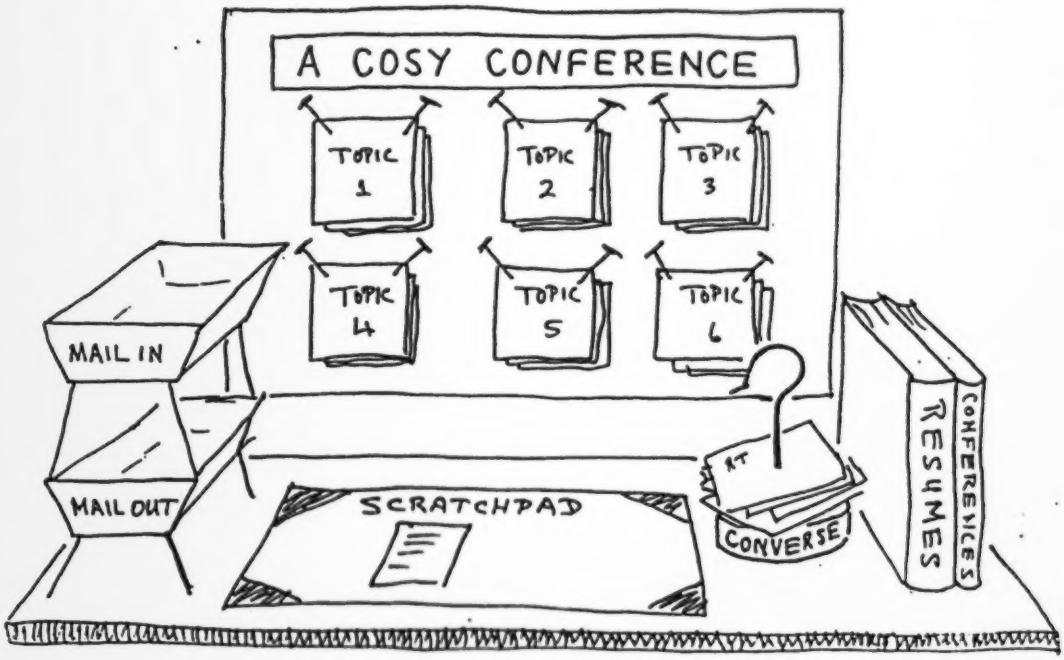

Figure 1 : A user's view of CoSy
(courtesy of Ray Thomas, Open University)

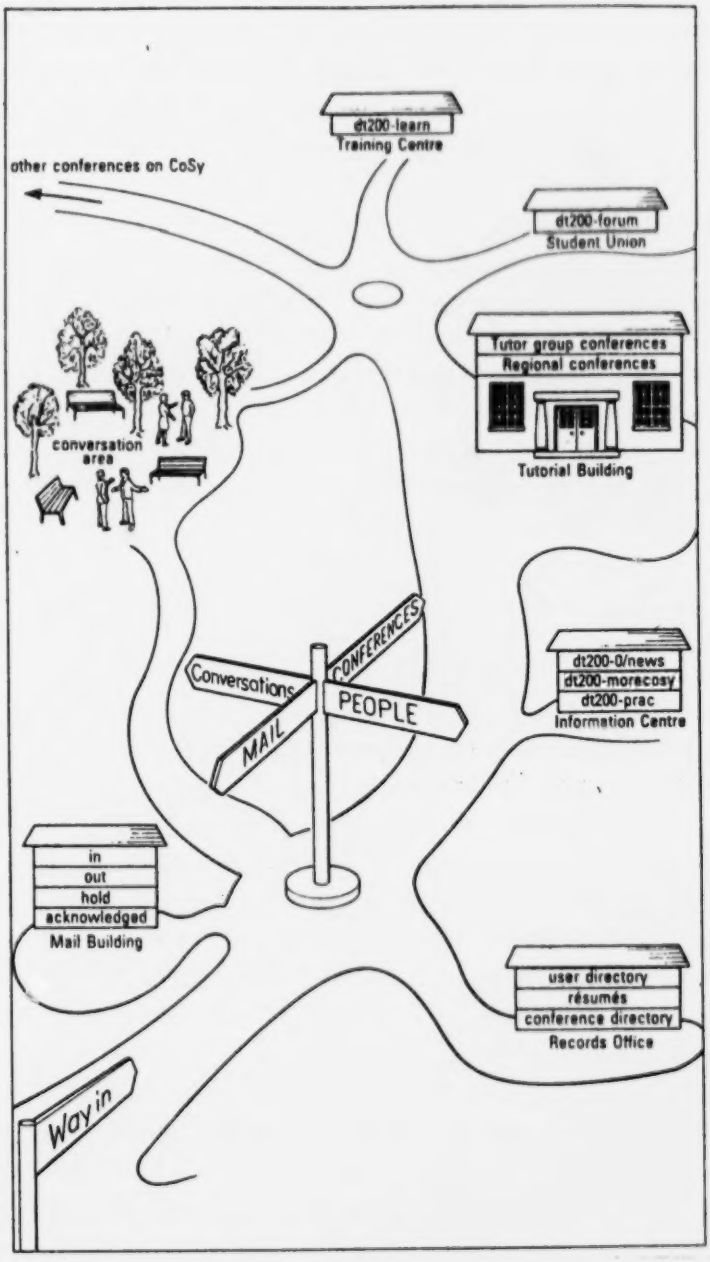

Figure 2: The DT200 Electronic Campus
(from Block 2, Part D of DT200, *An Introduction to Information Technology : Social and Technological Issues*, c Open University, 1988)